Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

Chromism of Model Organic Aerosol[1] ANGELA RINCON, CALTECH, MARCELO GUZMAN, HARVARD UNIVERSITY, MICHAEL HOFFMANN, AGUSTIN COLUSSI, CALTECH — The optical properties of the atmospheric aerosol play a fundamental role in the Earth's radiative balance. Since more than half of the aerosol mass consists of complex organic matter that absorbs in the ultraviolet and visible regions of the spectrum, it is important to establish the identity of the organic chromophores. Here we report studies on the chromism vs. chemical composition of photolyzed (lambda longer than 305 nm) solutions of pyruvic acid, a widespread aerosol component, under a variety of experimental conditions that include substrate concentration, temperature and the presence of relevant spectator solutes, such ammonium sulfate. We use high resolution mass- and 13C NMR-spectrometries to track chemical speciation in photolyzed solutions as they undergo thermochromic and photobleaching cycles. Since the chemical identity of the components of these mixtures does not change in these cycles, in which photobleached solutions gradually recover their yellow color in the dark with non-conventional kinetics typical of aggregation processes, we infer that visible absorptions likely involve the intermolecular coupling of carbonyl chromophores in supramolecular assemblies made possible by the polyfunctional nature of the products of pyruvic acid photolysis.

[1]Supported by NSF grant ATM-0714329

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Date submitted: 26 Nov 2007 Electronic form version 1.4